REMARKS

Applicants request favorable reconsideration and allowance of this application in view of the foregoing amendments and the following remarks.

Claims 1, 2, 5, 8, 10, 11, and 19 are pending in this application, with Claims 1, 10, and 19 being independent.

Claims 1, 8, 10, and 19 have been amended. No new matter has been added.

Claim 10 was objected to because of minor informalities. Applicants have amended that claim in view of the Examiner's comments and submit that the basis of the objection has been addressed. Withdrawal of the objection is requested.

Claims 1, 2, 5, 8, 10, 11 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,859,921 to *Suzuki*, in view of U.S. Patent No. 5,008,946 to *Ando* and U.S. Patent No. 6,257,722 to *Toh*. Applicants respectfully traverse this rejection for the reasons discussed below.

The present invention as recited in independent Claim 1 is directed to a human eye detection method that inputs an image, analyzes the image and gets a candidate eye area, and then performs specific steps to determine whether or not the candidate eye area is a real eye area. The invention of Claim 1 utilizes the fact that dark areas are distributed in a certain manner in a neighborhood region of the human eye (see paragraph [0058] of the published specification). The steps recited in Claim 1 to determine if the candidate eye area is a real eye area first determine a region based on the candidate eye area, where the region encompasses the candidate eye area and has its center at the center of the candidate eye area. Then, the size S of the region is calculated and the number N of dark areas in the region is determined, so that a ratio N/S of

dark area distribution can be obtained. The ratio N/S is compared to a predetermined threshold to determine whether the candidate eye area is a real eye area.

With these features, the present invention recited in Claim 1 provides a method to determine whether a candidate eye area is a real eye area or a false eye area, and it does so by determining the ratio of dark area distribution in a region encompassing the candidate eye area. Applicant notes that the invention of Claim 1 is for determining whether the candidate eye area is a real or false eye area, and not for extracting an eye area within a candidate area.

Applicants submit that the cited art, even if considered in combination, fails to disclose or suggest at least the above-mentioned features of Claim 1. Suzuki (USP5859921) discloses a structure using "eye searching area setting means", "candidate area setting means", and "eye area detection means", as shown in Fig. 2 of Suzuki. More specifically, the "eye searching area setting means" sets rectangular eye searching areas 40 shown in Fig. 6, the "candidate area setting means" sets the two areas BER1 and BER2 among the rectangular eye searching areas 40, as eye candidate band areas, as shown in Fig. 8, and then eye candidate areas 50 are set. Then, using the processing shown in Fig. 9, the "eye area detection means" determines whether the candidate area is real or false and whether the candidate area is the right eye or the left eye.

As understood from the above, Suzuki discloses setting an area and then narrowing the area down till the candidate eye area for each eye is set. In particular, Suzuki first sets the rectangular areas 40 and then sets the two areas BER1 and BER2 as candidate band areas before finally setting the eye candidate areas 50. Thus, Applicants submit that the setting of areas (or regions) in Suzuki is used merely to determine the candidate eye area, and not to determine whether the candidate eye areas are real or false eye areas. On the contrary, Applicants submit that the processing shown in Fig. 9 is what determines whether a candidate eye area is real or

false, and that processing does not involve setting any region encompassing the candidate eye area. Accordingly, Suzuki does not disclose or suggest the combination of features recited in steps c) – f) of Claim 1.

The Examiner states that the neighborhood region of the human eyes are analyzed in Figs. 7 and 8 of Suzuki. In particular, the Examiner asserts that the processing of Fig. 7 corresponds to step b) of Claim 1 and that the processing of Fig. 8, which sets band areas BER1 and BER2, corresponds to step c) in Claim 1 of determining a region encompassing the candidate eye area. However, Applicants submit that the setting of band areas BER1 and BER2 in Suzuki is part of the process of determining the eye candidate areas, not part of determining whether an eye candidate area is real or false. Thus, Applicants submit that the processing in Fig. 8 does not correspond to step c) in Claim 1, but rather the processing in both Figs. 7 and 8 of Suzuki corresponds to step b) in Claim 1.

In other words, step b) in Claim 1 recites getting a candidate eye area and then step c) recites (after already getting the candidate eye area) determining a region based on the candidate eye area. In contrast, Suzuki discloses that an eye searching area 40 is set and then bands BER1 and BER2 are nominated as eye candidate band areas (*not* as eye candidate areas). It is only after the processing of Fig. 8 that the eye candidate areas 50 are obtained. (See, col. 20, lines 24-56 of Suzuki.) Applicants submit that Suzuki does not disclose or suggest determining any region based on eye candidate areas 50, after getting the eye candidate areas. Accordingly, Applicants submit that Suzuki does not disclose or suggest any feature corresponding to at least step c) of Claim 1, i.e., determining a region based on an eye candidate area, which encompasses the eye candidate area and has as its center the center of the eye candidate area.

Applicants submit that the other cited art fails to remedy the above-mentioned deficiencies of Suzuki. The Examiner cites Ando as teaching a method for calculating a region's size, detecting and counting dark areas in the region, and comparing the ratio of number of dark areas to size of the region to a threshold to detect a pupil. Further, the Examiner proposes substituting the method of Ando for the EFV method used in Suzuki to determine whether a candidate eye area is a real or false area. Applicants submit that Ando likewise fails to disclose or suggest at least the above-mentioned feature of determining a region based on the candidate eye area. Further, Applicants respectfully submit that the Examiner's proposed substitution is not well founded for at least two reasons:

First, Applicants submit that there is no reason that one skilled in the art would substitute the technique of Ando for the EFV method in Suzuki. The technique of determining an area's size, counting dark areas, and determining a ratio in Ando is not used for detecting a pupil directly. Rather, that technique is iteratively used to determine a threshold TH_e for discriminating black pixels from other pixels. (Col. 18, lines 3-57 of Ando.) After the image data is digitized using the threshold TH_e, then the dimensions of black regions in the digitized image are calculated, and a decision is made as to whether the dimensions coincide with the dimensions of human eyes. (Col. 18, lines 60-67 of Ando.) Thus, in Ando, the pupils are detected by looking for black regions having the dimensions expected for a human eye, not by simply comparing a ratio N/S to a threshold. Accordingly, even if one skilled in the art attempted to substitute the technique of Ando for the EFV method of Suzuki, it still would not result in the feature of determining whether or not a candidate eye area is a real eye area by comparing the ratio N/S to a predetermined threshold. Instead, the comparison to the threshold would only aid in setting a threshold for determining whether a given pixel should be deemed

black, and then the size of the black region would have to be determined and compared to an expected dimension to verify whether the pupil seems to be a human pupil.

Moreover, Applicants submit that there is no reason one skilled in the art would attempt to apply the technique of Ando to an eye candidate area 50 in Suzuki. In Ando, the technique of calculating a regions' size, detecting and counting the number of dark areas, and comparing the ratio of dark areas to size with a threshold is performed iteratively for a region S_d to determine a threshold value for digitizing image data. The region S_d is a region defined based on the end positions and width of a forehead. (Col. 17, line 52 – col. 18, line 14 of Ando.) Thus, Applicants submit that there is no reason one skilled in the art would take a technique used to set a threshold value for a large section of a face in Ando and apply it within a specific eye candidate area 50 of Suzuki.

Applicants further submit that Toh also fails to remedy the above-noted deficiencies. Toh discloses that an image is divided into 16 areas by dividing each side of the image into four parts (col. 5, lines 5460). The number of pixels in each area is counted and the relative counts are used in determining an area that includes a pupil (col. 6, lines 10-51). Thus, Applicants submit that Toh also fails to disclose or suggest determining a region based on a candidate eye area. Further, that patent makes no mention of determining a ratio of a number of dark areas in a region to a size of the region, or of determining whether a candidate eye area is a real eye area by comparing a ration N/S to a predetermined threshold. Thus, even if combined with the teachings of the other cited art, Applicants submit that Toh discloses nothing that would render obvious the present invention recited in Claim 1.

In summary, Applicants submit that the cited art, whether considered individually or in combination, do not disclose or suggest at least the features of getting an eye candidate area,

determining a region based on the eye candidate area (the region encompassing the eye candidate area and having its center at the center of the eye candidate area), and determining whether the eye candidate area is a real eye area or false eye area by comparing a ratio N/S for the region to a predetermined threshold. In particular, none of the cited art discloses or suggests determining a region based on an eye candidate area as recited in Claim 1 (after already getting the eye candidate area), or performing the size calculation, counting of dark areas, and comparison of a ratio N/S for the region to a threshold to determine whether the eye candidate area is a real eye area, as recited in Claim 1.

For the foregoing reasons, Applicants submit that the present invention recited in Claim 1 is patentable over the art of record.

The other independent claims recite features similar to those of Claim 1 discussed above, and are believed to be patentable for reasons similar to those discussed regarding Claim 1.

The dependent claims are believed patentable for at least the same reasons as the independent claims, as well as for the additional features they recite.

For the foregoing reasons, this application is believed to be in condition for allowance. Favorable reconsideration, withdrawal of the outstanding objections and rejections, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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